PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXX. DECEMBER, 1892. No. 139.

On the Mutual Relations Between the Orbits of Certain Asteroids.

By Daniel Kirkwood, Riverside, Cal.

(*Read before the American Philosophical Society, September 2, 1892.*)

The present writer, several years since,* called attention to the fact that in some parts of the asteroid zone the orbits of particular members have a striking resemblance to each other. These significant coincidences have been regarded by astronomers as worthy of study, and, in addition to the binary and ternary clusters pointed out by the writer, others have been designated by Tisserand,† of Paris, and by Monck, of Dublin.‡ These groups, according to the former, cannot be regarded as chance arrangements. "A glance at the list," says Mr. Monck, "will show that the resemblance frequently extends beyond a single pair and embraces what may be called a family—a circumstance which is known to occur in the case of comets also." The writer's list (which might be extended) is as follows :

GROUPS OF ASTEROIDS.

	NAMES.	a	e	i		π	
I.	Huberta ...	3.4586	0.1103	6°	16′	329°	45′
	Hermione ..	3.4535	0.1255	7	36	357	36
II.	(106) Dione.....	3.1670	0.1788	4	38	25	57
	(104) Clymene ...	3.1560	0.1407	2	53	62	30
	(171) Ophelia....	3.1554	0.1142	2	33	148	31
	(62) Erato	3.1241	0.1756	2	12	39	0
	(287) Silesia.....	3.1190	0.1217	3	40	65	16
	(212) Medea	3.1157	0.1013	4	16	56	18
	(86) Semele.....	3.1015	0.2193	4	47	29	10
	(305)	3.0973	0.1927	4	26	104	37
	(345) Vera.....	3.0966	0.1975	5	11	27	48
	(223) Rosa.....	3.0937	0.1206	1	59	106	35
	(268) Adorea.....	3.0853	0.1285	2	25	184	48

*1887. †Annuaire, 1891. ‡ *Sid. Mess.*, October, 1888, p. 334.

	Names.	a	e	i		π	
III.	(238) Hypatia....	2.9081	0.0876	12°	23′	28°	24′
	(191) Kolga.....	2.8967	0.0876	11	29	23	21
IV.	(1) Ceres	2.7673	0.0763	10	37	149	38
	(237) Cœlestina ..	2.7607	0.0738	9	46	282	49
V.	(116) Sirona.....	2.7669	0.1433	3	35	152	47
	(278) Paulina	2.7575	0.1331	7	50	199	52
	(213) Lilaea.....	2.7563	0.1437	6	47	281	4
VI.	(206) Hersilia	2.7399	0.0389	3	46	95	44
	(203) Pompei	2.7376	0.0587	3	13	42	51
	(160) Una.....	2.7287	0.0624	3	51	55	57
	(301) Bavaria	2.7258	0.0660	4	53	24	4
VII.	(97) Clotho	2.6708	0.2550	11	46	65	32
	(3) Juno.....	2.6683	0.2579	13	1	54	50
VIII.	(249) Asporina...	2.6947	0.1050	15	38	256	6
	(218) Bianca	2.6653	0.1155	15	13	230	14
IX.	(66) Maia	2.6454	0.1758	3	6	48	8
	(37) Fides	2.6440	0.1750	3	7	66	26
X.	(193) Ambrosia ..	2.5758	0.2854	11	38	70	52
	(134) Sophrosyne	2.5647	0.1165	11	36	67	33
XI.	(79) Eurynome .	2.4436	0.1945	4	37	44	22
	(19) Fortuna....	2.4415	0.1594	1	33	31	3
XII.	(249) Ilse	2.3793	0.2195	9	22	14	16
	(115) Thyra.....	2.3791	0.1939	11	35	43	2
	(84) Clio	2.3629	0.2360	9	40	339	20

Note.—a, e, i and π represent the distances, eccentricities, inclinations and perihelia respectively.

Remarks.

1. The second cluster has eleven known members, the average inclination being about 3° 35′, that is, no one differs from the mean as much as 2°. Of the other groups, several are not less striking in the closeness of their relations.

2. When the earth, as well as Mars itself, was yet a part of the solar atmosphere, these individual planetoids were starting on the paths prescribed them. Into how many nebulous fragments they may have been subdivided, and to what extent these ramifications may yet be traced, let the astronomer of the future inquire.